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Persistent Echoes of the Nature-Nurture Argument

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In an article written in 1950 and called "Old and New Pathways in Human Genetics," Snyder stated that empirical observations in human genetics were insufficient to test hypotheses based on established genetic theory [1]. The years since 1950 have brought an abundance of such observations with the practical outcome of many busy genetics clinics where diagnosis, treatment, and counseling are dispensed by well-trained medical geneticists. Medical genetics has also penetrated the curriculum of most medical schools, and questions about inborn errors and chromosome aberrations have appeared on the National and Specialty Board examinations. Medical genetics has arrived.

But there is evidence that the arrival has not been noted as widely as the fanfare suggests, or perhaps the trumpets have been heard, but what follows them has not been perceived uniformly. For example, a study of the attitudes of 1,092 American physicians towards genetic screening reported by Rosenstock [2] revealed that fewer than half considered "genetic" disease a serious practical problem. And as for screening for phenylketonuria or sickle cell disease, most were not sure such efforts were worthwhile. On the other hand, the doctors recognized their deficiency in providing genetic counseling, and cited the need for specialized genetic centers for this purpose.

The sample included pediatricians, obstetricians, and family physicians. The pediatricians were the most knowledgeable about genetics and the family doctors the least. Physicians longest in practice were the least aware, but the responses of even the youngest gave no cause for rejoicing. The study by Beck et al. [3] confirms the conclusion of Rosenstock [2] that physicians are late in recognizing the importance of genetics except perhaps as it concerns patients with especially exotic conditions seen only once in a blue moon.

But genetics is a discipline whose usefulness in medicine is directly proportional to the number of physicians who embrace it. If it is familiar only to medical geneticists and is ignored by other physicians, early diagnosis of disease will be imperiled, counseling will be inadequate, effective preventive medicine will be obstructed, and revealing insights into the nature of disease will be missed. If the role of genetics in the pursuit of these

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medical aims is not now widely appreciated, we should ask why and what to do to improve the position.

WHY IS GENETICS NOT FAMILIAR TO PHYSICIANS?

The answer to this question must lie in how doctors perceive genetics in relation to the conventional missions of medicine; that is, in diagnosis, management, and prevention. The views of medical geneticists are clearly enough revealed in their writings and actions, but little is known about those of other physicians. Failing such a study, some impressions may be derived from examination of such readily accessible materials as textbooks, papers, records of meetings, presidential addresses, and the like.

Textbooks of Medicine and Pediatrics

Textbooks are always more representative of prevailing thought than journals which present the novel and untried. They also reveal how medical knowledge is systematized and diseases are classified so that both the organization and the content of such books will suggest what is generally regarded as important.

An examination of the latest editions of three textbooks on internal medicine [4–6] and two on pediatrics [7, 8] revealed that each contains a well-written section outlining the salient principles of genetics and filling from 0.9% to 4.0% of the pages of text. But there is very little reinforcement of these concepts in the remaining sections of the texts. Such reinforcement is inhibited by two characteristics of these books. First, descriptions of disease are representative of the whole species and tend to omit those influences which account for the variations that distinguish one patient from another. Secondly, the organization of the material leads to a constricted view of genetics. Although each book has chapters devoted to such fundamental principles as the approach to patients, diagnosis, symptomatology, growth and development, and the like, the bulk of each is arranged according to the conventional typological and etiological classification of disease, an arrangement which casts genetics in its etiologic role, leaving other aspects in the shadow. Thus, mutant genes and abnormal chromosomes are emphasized as "causes" of disease akin to bacteria, viruses, and toxic substances. This in turn leads to classification of diseases as "genetic" or "acquired," polarizing hereditary and environmental influences. This polarity is subtly enhanced by the very existence, as well as the separate treatment, of the genetics chapters, since they may be seen by the reader in the same light as sections on infections or other causes of disease. Indeed, one text has a chapter on environmental causes of disease which (infelicitously) follows that on genetics.

There is also a curious identification of hereditary with idiopathic causes. For example, in one book "family history" is listed, with unconscious irony, as one among several risk factors for atherosclerosis, a list which includes hyperlipidemia, hypertension, obesity, and diabetes, all qualities through which heredity may be supposed to operate. While all of the books state that most cases of diabetes are hereditary, some also list "secondary forms" of the disease which themselves are hereditary, and similar distinctions are found in chapters on arterial hypertension, gout, and epilepsy. This confusion is merely semantic, but it represents how little genetics has penetrated disease classification.

In emphasizing the genes as agents of disease, the analogy of genetics with biochemistry and physiology is missed. Throughout the books there are references to the biochemical and physiological mechanisms through which diseases express themselves, but the fact that genetics is also a discipline of general application and that the genes exert ultimate control over those mechanisms, contributing materially to the variations in them which account for disease, is too often ignored.

Nor is the relation of genetics to preventive medicine given much attention. Both pediatric textbooks have sections on prevention, but the applications of genetic knowledge to that end appear only in the sections on genetics. Among those on internal medicine, although myocardial infarction, arterial hypertension, diabetes, gout, and chronic obstructive pulmonary disease were all said to be familial, only one suggested testing sibs and other relatives, and that one only for hyperlipidemias. In sum, these textbooks leave the reader with the impression that the genes and chromosomes are agents of disease, along with microorganisms, toxic substances, and other products of the environment. This is an important view of genetics, but an uninclusive one and one in which, in the separate and equal treatment given to genes and environment, we may recognize a latter-day version of the nature-nurture controversy.

Continuing Education

More than 90% of the physicians polled by Rosenstock wanted continuing education in genetics. In addition, the family physicians reported that the journals they read contain little information on the subject. Thus, if they are to obtain such knowledge, it must come from postgraduate courses. The *Journal of the American Medical Association* lists about 4,000 continuing education courses given in the United States for the years 1974–1975 and 1975–1976 [9, 10]. What would a physician, eager to learn genetics, find there? Table 1 reveals that not much is offered. Only 16 courses were listed under the heading of genetics. This number is exceeded by those listed under such parochial labels as aerospace medicine, colon and rectal surgery, and forensic medicine. Among 768 courses listed under general medicine, there was one in genetics. On the other hand, in

TABLE 1

GENETICS COURSES GIVEN IN CONTINUING EDUCATION COURSES LISTED IN *JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION*, 1974–1976

HEADING IN JAMA LIST*	NUMBER OF COURSES	
	Genetic	Total
Family medicine	3(1.0)†	306
General medicine	1(0.1)	768
Genetics	16(100.0)	16
Internal medicine	2(0.4)	456
Obstetrics/gynecology	6(1.9)	311
Public Health/preventive medicine	0(0.0)	75
Pediatrics	3(0.9)	326
Total	31(1.4)	2258

NOTE.—Nos. in parentheses = percentages.

* In all there were 47 headings. The seven above were chosen as the most likely sources of genetics courses.

this same category there were courses in diving medicine, sports medicine, ski medicine, medicine and religion, medicine and relaxation, sleep, and acupuncture. Obstetrics, pediatrics, and others add a few more courses in genetics, but a doctor who consults the AMA list can find very little.

But perhaps titles are not representative of content. Courses entitled "Recent Advances" or "Trends" may contain lectures and demonstrations intended to quench the genetical thirst. Table 2 shows that this is so. The data were taken from advertisements for continuing education courses exclusive of genetics which came to me in the mail from July 1974 to July 1976. The table shows a minimal amount of genetics in continuing education in pediatrics and allied subjects.

Preventive Medicine

The column in Table 2, entitled "Population Genetics," reveals that few of the lectures dealt with the practical application of this aspect of genetics to screening or other forms of preventive medicine. But if these services are to be useful, it will be because of their general application, not because a few persons are well served. And it is not apparent how preventive ideas are to be implemented except through well-informed physicians who support them with enthusiasm.

On the other hand, a lack of interest in population genetics and preventive medicine is not unexpected since conventional medical practice is so largely directed to treatment of disease. This orientation is reflected in research societies of internal medicine and

TABLE 2

GENETICS LECTURES PRESENTED IN CONTINUING EDUCATION COURSES

TYPE OF PROGRAM	No. PROGRAMS	No. LECTURES	GENETIC LECTURES	
			General	Population
General pediatrics	35	944	36	8
Neonatology	16	308	9	4
Cardiology	9	207	11	2
Neurology	7	132	7	0
Dermatology	5	94	9	0
Nephrology	3	92	3	0
Hematology	4	42	6	0
Adolescent medicine	2	28	0	0
General medicine	7	310	1	0
Ear, nose and throat	3	67	4	0
Endocrine	6	111	4	0
Radiology	3	100	0	0
Psychiatry	4	43	0	0
Oncology	2	39	0	0
Nutrition	2	17	0	0
Other	3	30	0	0
Allergy	1	35	0	0
Gastroenterology	4	85	0	0
Obstetrics/gynecology	2	83	2	0
Surgery	4	114	2	0
Total	122	2881	94(3.3)*	14(0.5)*

* Numbers in parentheses represent the percentage of total lectures which dealt with genetics.

pediatrics. Table 3 shows that most of the genetic papers presented at the plenary sessions or the genetics sessions of the meetings of these groups deal with the classification, diagnosis, elucidation of mechanisms, and treatment of disabling genetic disease.

As for textbooks and papers on preventive medicine, there is evidence of less awareness of genetics than in the literature of medicine and pediatrics [11, 12]. In the emphasis on extrinsic causes of disease and the prescription of abstinence or moderation of living habits equally for all, the genes are ignored, and the inference is that nurture is more important than nature.

This failure to see the affinity between genetics and prevention of disease is, unhappily, especially pronounced among physicians who profess preventive medicine most directly; the schools and departments of public health, preventive medicine, community medicine, and family medicine, and the medical schools which give the most emphasis to these new disciplines are the schools which pay the least attention to genetics [11].

Presidential Addresses

Since research to discover the mechanisms of hereditary disease has met with such signal success, the impact of genetics on medicine might be expected to occupy the thoughts of established figures in medical research, and if so, it might creep into the annual orations of the presidents of medical and pediatric research societies. Of 20 such addresses given during the years 1971–1975, 16 appeared in print, and in none did either genetics or preventive medicine loom as of particular consequence. On the other hand, the address of the president of the Society for Pediatric Research given in 1976 was devoted altogether to these issues [13].

In summary, I infer that those physicians who think of genetics at all perceive it mainly in diagnostic terms; the genes are the causes of certain diseases, mostly rare, in contrast to extrinsic agents which cause other diseases, mostly common. And if one were to ask which cause was more important in relation to the whole load of human disease, the nod would be given to the latter. That is to say, genetics has been adapted to the traditional medical paradigm which appears to have resisted its liberating principles.

TABLE 3

RESEARCH PAPERS IN GENETICS PRESENTED AT MEETINGS OF RESEARCH SOCIETIES

Years	Research Organizations*	Clinical Genetics, Chromosomes, Biochemical and Molecular Genetics	Population Genetics	Total
1972–1976	APS, SPR	93(80.1)	23(19.9)	116(100.0)
1972–1976	AFCR, ASCI AAP	86(93.4)	6(6.6)	92(100.0)
Total	...	179	29	208

NOTE.–Nos. in parentheses = percentages.

* *APS* = American Pediatric Society; SPR = Society for Pediatric Research; AFCR = American Federation for Clinical Research; ASCI = American Society for Clinical Investigation; AAP = Association of American Physicians.

WHY HAVE THESE PERCEPTIONS PERSISTED?

The answer to this question is unknown; to discover it would be an interesting study, but some clues may be found in a consideration of generally accepted concepts of disease and from a look at the institutional structure of medical practice.

Concepts of Disease

In the traditional view, disease is a state of impaired health due to a particular cause. Each disease is given a name, usually derived from the organ system most evidently involved, and is endowed with its own identity, dimensions, and properties. Indeed it may overwhelm the individuality of the human being who suffers it; the latter may become simply a "case" of something. The disease is then said to be communicable or transmissible, lethal or self-limited, or in relation to cause, it is said to be hereditary or acquired. This reification of disease, while useful for communication, obscures a more comprehensive definition of disease as a state of individual homeostatic abnormality. In the latter view, the disease is an abstraction, the reality is the inability of one person's homeostasis, conditioned by his genotype and a lifetime of special experiences, to maintain equilibrium; neither genes nor environment "cause" disease, it is simply that the organism is unsuited for adaptive action in one, or several, environments.

Such a definition of disease has several virtues. First, it surmounts the nature-nurture argument; neither gene nor environment is more "important" in the genesis of any character. For example, phenylketonuria is an "hereditary" disease, but without an "environment" of excessive dietary phenylalanine there is no disease. Automobile injuries or gun shot wounds are certainly "environmental" hazards, but largely because there are no human genes capable of producing a carapace or a retractable head. The question is perhaps most pointedly posed by the recent discovery of genetically determined receptors for infectious agents [14]. If genes determine whether such agents can infect, should we call the diseases themselves hereditary or environmental? In practice, when considering a particular variation, we do say that one or other of these elements is more important, usually depending upon whether the host factors involved and the degree to which they are shared by the whole species are known, but in teaching the pathogenesis of disease, we should differentiate between practice and concept. Geneticists contribute subtly to this perpetuation of the "which is more important" question by making estimates of the incidence of "genetic" disease. There is practical value in making such counts, but an ignorant person might be pardoned for missing an important point if it is obscured by those to whom he must apply for knowledge.

Secondly, such a definition places disease squarely where it should be—in an evolutionary and social context. It recognizes disease as one part of a continuous distribution of adaptive states varying from robust good health to just short of death and reveals its connection with the biological and cultural structure of a society, transcending the conventional restrictive concept of etiology [15–17].

The Institutional Structure of Medicine

Human genetics developed mainly outside medicine; it was the province of botanists or zoologists to whom it was an avocation. It has been imposed, therefore, from without, but unlike biochemistry and physiology which are traditional partners to medicine,

genetics had no opportunity to influence the evolving structure of medical practice, research, and education.

Medical practice. Some of the traditions of medical practice which inhibit the perception of genetics as a useful point of view follow:

1. The proprietary attitude of a physician toward his own patients tends to preclude active concern for their relatives when the latter are the patients of another doctor [18]. Though he might suggest they see their doctor, he is unlikely to be vigorous in pressing a sib or collateral relative to be examined for evidence of a gene present in his own patient. In addition, the diagnostic process, focusing on a single patient, does not lend itself easily to including relatives [19].

2. Medical practice is traditionally episodic with little time devoted to prevention. Pediatricians do some of this kind of work, and some internists do periodic examinations, but the evidence is that neither finds these exercises as gratifying as intervening in overt disease [16, 20–22]. Furthermore, the idea of selective prevention by discovering genetic susceptibilities in individuals is not generally accepted [23].

3. Changes in the composition and attitudes of medical school faculties since World War II have also contributed. The cleavage between full-time and part-time faculty deepened, specialism became narrower, emphasis on basic research increased, and the differentiation between teaching and community hospitals became pronounced [24, 25]. One result was the intellectual and physical isolation of the community-based doctor from the hospital-based specialist to whom he must refer patients. Genetic clinics may contribute to this isolation even while trying not to, since the recognition of the necessity to refer the case may cause the community doctor to fall into the mistaken belief that the genetics involved is as arcane as he assumes the biochemistry to be, and so to give up on both.

Specialization itself contributes to further compartmentalization. Genetics has been forced into this mold; nongeneticists speak of dermatogenetics, ophthalmologic genetics, even pediatric genetics, increasing the conceptual distance between the generalist and knowledge which, if only he knew it, is not difficult to grasp and applies equally to all branches of medicine. This distance is further increased through the use of parochial jargon which, while promoting communication among those in the know, does nothing to enhance the understanding of the uninitiated.

4. Practicing physicians generally limit their responsibility to the immediate care of patients and regard attitudes to social problems as matters of personal conscience [18]. Questions of environmental control or public education are left to public health authorities who are expected to provide the bridge between political institutions and medical care. Thus a patient with a disease associated with a particular mutant gene is seen to be the concern of the practitioner, but the dissemination of a mutagen which may lead to new examples of that same disease is seen as the business of some public health agency, while the spread of a mutant through a population is generally perceived to be no one's affair [16, 21, 22].

Medical research. There is no question that studies of the classification and description of disease, of the biochemical and physiological aspects of pathogenesis, and of treatment have all flourished. Population genetics is also supported, but research on methods for the practical employment of genetics in medicine, and for evaluation of its

impact, has not received the same attention (table 3). This means that the necessary preliminary work to demonstrate to practitioners the virtues of these forms of preventive medicine has been limited [23].

Medical Education

Genetics in the medical curriculum. Nearly all medical schools now offer a required course in genetics. These courses, usually given in the freshman year, must teach fundamentals as well as prepare the student for the clinical years. In this they are similar to courses in biochemistry, with the difference that although there is much subsequent reinforcement of the latter, reinforcement in genetics is left largely to chance. The reason for this is that in the clinical clerkship system the student-apprentice learns from, and models himself after, house officers, attendings and consultants, and if these dignitaries are not genetically oriented, it will be a rare student who will achieve that insight for himself.

Preventive medicine in medical school. Public health and preventive medicine are greeted by medical students with indifference and have been the object of the hostility of organized medicine [21, 22]. These attitudes represent an extraordinary myopia, since it is agreed that the prolonged fall in mortality from infections, nutritional disorders, and other conditions is due less to the attention of individual doctors than to social changes engineered in part by public health physicians [16, 21, 22, 26]. Still, the emphasis on treatment by medical teachers excludes prevention, and it is possible that the cool reception it is given by medical students may be the result of some of the same factors which have inhibited interest in genetics. Nor is the position likely to change soon. In a Delphi survey, the deans of most medical schools in the United States put greater involvement with public health and preventive medicine at the top of a list of changes they considered most desirable, but 17th on their list of things most likely to occur [27].

WHAT TO DO

A Genetic Point of View

A remedy for these deficiencies in knowledge and application might be found in the cultivation in the minds of medical students and doctors of a "genetic point of view" in the context of which a physician can look at every patient he sees. For example, when a baby is admitted to the hospital with staphylococcal pneumonia, we often test the integrity of his immunological and cellular defenses, or if the patient has rickets, we test his responsiveness to vitamin D. What we are doing is determining where in a continuous distribution of measurements of susceptibility these patients' capacities to resist infection or to use vitamin D lie. The essence of the genetic point of view consists of discovering where in each of many such distributions the measurements of an individual's characteristics lie, and why they lie there. Such a point of view, stemming as it does from the primary principles of genetics, cannot become obsolete as a result of new theoretical considerations or the accumulation of new facts. Of what use is such a viewpoint to a physician in practice? First, it dispels the nature-nurture myth and offers a view of disease as an aberration of adaptation in the face of conditions which are suboptimal, not necessarily for all, but for one genetically and socially distinct

individual. Disease is seen from an individual, as opposed to a statistical, standpoint and as differing quantitatively from health.

Second, it should give the doctor a better insight into the causes of the differences and similarities between related and unrelated persons suffering the same disease; he should be able to predict that some of the variation is assignable to allelic or multilocal differences, and his knowledge of the inexhaustible store of mutations frees him to imagine that his patient may have a unique disorder.

Third, it should prompt him to wonder why the same circumstances provoke illness in one person and not in another, and to ask whether such a response may be familial. This, in turn, may cause him to think about prevention of disease in his own patients and to extend his thoughts to all of the members of a patient's family, even those not included in his own practice.

And finally, his knowledge of the genetic kinship of all human beings might give him a sense of responsibility transcending his own practice to include the health of the whole species. For example, the control of mutagenic (and carcinogenic) agents could be influenced by physicians both in their advice to patients and in their role as members of medical societies.

CAN IT BE DONE?

The conventional means of introducing ideas leading to changes in attitudes are teaching and example, and geneticists are engaged in both, but the opportunities to teach and the impact of the example are both limited by those who hold the attitudes that must be changed. The question is how to do it, and the Delphi survey of deans suggests only a modest level of expectation for immediate success. Indeed, the deans believe that while the public will demand more emphasis on prevention, the medical profession will resist it [27].

Teaching in Medical School

Formal teaching. More might be done to heighten the awareness of medical students if it were not necessary to do three things at once: (1) to teach the rudiments of genetics to students who arrive inadequately prepared; (2) to demonstrate the application of genetic principles to the study of human variation; and (3) to explore the relation of genetics to medical practice.

These three goals are incompatible with the developmental state of first-year medical students. Where genetics is not a prerequisite for admission, the pace of the course is too fast for some and too slow for others. In addition, demonstration of patients and detailed reference to disease, while an exciting aperitif for students eager for more substantial fare, may be more distracting than helpful.

The solution to this dilemma is as simple as it is unlikely to be adopted; each of the three aims should be fulfilled separately and at a seasonable time. Knowledge of the fundamentals ought to be a prerequisite for entry into medical school. During the first year, time should be devoted to the study of human variability, and the uses of genetics to further medical aims should be reserved for a time after students have finished the preclinical sciences and have studied physical and laboratory diagnosis.

These changes will not soon be made for reasons often cited; to add more science to the

baccalaureate curriculum narrows the focus of the premedical student and reduces his already precariously limited exposure to the humanities, and the medical curriculum is already crammed to bursting with essential subjects. Both of these reasons are nonsense. A good case can be made for the humanizing influence of genetics, and as for the medical curriculum, when has it not been filled? The principal obstacle to altering it is likely to be the lack of will to change and the protection of territorial rights at the expense of the commonweal.

Informal teaching. Teaching during clinical clerkships is largely informal. The students, who have been waiting restlessly to try their skills with actual patients, are impatient of theory and "points of view" and demand the details of diagnosis and treatment. So the teachers most likely to become their models are those who exhibit the most detailed knowledge of disease and the greatest ease and skill in patient care. And that is as it should be; students should admire and copy the best clinicians. It is only that unless such teachers themselves have a genetic point of view they cannot transmit it. If they see the genes only in the restricted context of causes of disease, or nature as more important here and nurture there, that is the attitude which the student will adopt, his teaching in the past notwithstanding. So the problem is one of inoculating the clinicians and consultants with the idea that genetics is as much their concern as that of the geneticist, and this represents a change of thinking which is likely to be resisted.

Continuing Education

Formal teaching. It should be the aim of postgraduate education in genetics to accomplish the same goals as those outlined for medical school—to teach the contribution of the genes to human variability, and the uses of genetic knowledge in medical practice. Clearly some of this is already being done; one can cite the Bar Harbor course in human genetics, and the National Foundation, the American Academy of Pediatrics, and the American College of Physicians who regularly promote educational conferences, as well as many individual medical geneticists who have organized courses in their own localities; but the lack of opportunity revealed by the *JAMA* lists of courses suggests the need for more. How successful these efforts are, or can be, is unknown; it is a field for evaluation. Perhaps less can be expected than in medical school teaching, given the age and maturity of the "students," but experienced practitioners are very good at grasping what they see is directly related to their work.

Informal teaching. Reinforcement of knowledge gained in continuing education might be accomplished through informal contacts between genetics clinics and referring doctors. If the practicing doctor can be persuaded that he *can* handle genetics, he can also be persuaded to assume responsibility for some counseling and other attentions he is now accustomed to asking the clinic to take on. Experience suggests that something of this kind can be done [28].

Research

If the idea that genes and chromosomes are associated with disease has been received by some doctors, it is because they were convinced by the strength of the evidence. If they have not yet perceived the broader applications of genetics, it may be because it has been insufficiently demonstrated in the form of compelling data. Perhaps the quest for

the cause of diseases in the form either of genes or extrinsic agents has had priority over, for example, the search for epistatic or modifying genes or epidemiological studies aimed at discovering subtypes of multifactorial conditions, or studies designed simply to elucidate the amount and quality of human variation. And if there is insufficient attention given to prevention of disease, it may be because we have not yet the data to do more than make a beginning [29, 30]. To my mind, the greatest spur to learning genetics and its relation to preventive medicine will be the discovery of the nature of the genetic contribution to such common conditions as allergy, cancer, hypertension, gout, responses to drugs, and mental illness and other behavioral characteristics. These are conditions which most doctors meet, and about whose properties they cannot afford to be ignorant.

How these data are to be gathered is not clear, but an epidemiological approach might be a way to begin. It paid off handsomely in the study of myocardial infarction by Goldstein et al. [31–33], and the studies of the relation of HLA antigens to many disorders is another example [34]. Another possibility suggested by Swift et al. [35] consists of looking at the medical careers of persons heterozygous for genes associated with recessive diseases on the assumption that the common ones might contribute some share of the polygenic predisposition to disease. And a final example is given by Knudson's ingenious method for the investigation of the role of genes in childhood forms of cancer [36]. All of these efforts involve an epidemiological approach, a discipline which, apart from population genetics, has been too little used in genetic research, although the near identity of the aims of epidemiologists and geneticists has been noted by the former [37].

CONCLUSION

There is some evidence that genetics is ignored or poorly understood by many physicians and is perceived in a restricted way by others. The latter see its application to disease in terms of cause and equate genetic influences with agents of the external environment in a new, but still restrictive, version of the nature-nurture controversy. These limited perceptions of genetics may be due to the traditional attitudes of physicians toward their patients, to their disease orientation, and to other institutions of conventional practice. They may also be due to a lack of the kind of information which can draw the practitioner's attention to the role of genetics in preventive medicine. These deficiencies may be remedied in part by intensification of already existing teaching in medical school and beyond, and by research designed to discover the data which would direct the physician's attention to health as well as disease, demonstrating that a genetic point of view can be useful to him in all aspects of his work.

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Harold Cummins Memorial Dermatoglyphics Symposium

A dermatoglyphics symposium and workshop will be held March 28–31, 1977 in the Convention Center at the Gulf State Park Resort, Gulf Shores, Alabama, in honor of the late Dr. Harold Cummins of Tulane University, New Orleans. The meetings, sponsored by the American Dermatoglyphics Association and the Department of Medical Genetics, University of South Alabama, Mobile, are designed to introduce newcomers to dermatoglyphic techniques and to review the present status of the science. For information write to Dr. W. Wertelecki, Department of Medical Genetics, University of South Alabama, 2451 Fillingim Street, Mobile, Alabama 36617.